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REMARKS

This is a full and timely response to the non-final Official Action mailed October 30, 2007 (the "Office Action" or "Action"). Reconsideration of the application in light of the above amendments and the following remarks is respectfully requested.

Claim Status:

Claims 3-5, 19 and 57 were cancelled previously without prejudice or disclaimer.

Under the imposition of a previous Restriction Requirement, claims 21-36 and 45-47 were withdrawn from consideration. Accordingly, to expedite the prosecution of this application, withdrawn claims 21-36 and 45-47 are cancelled by the present paper without prejudice or disclaimer. Applicant reserves the right to file continuation or divisional applications as permitted by 37 C.F.R. to the withdrawn claims or to any other subject matter described in the present application.

By the forgoing amendment, various claims have been amended. No claims are cancelled apart from those noted above. No new claims are added. Thus, claims 1, 2, 6-18, 20, 37-44 and 48-56 are currently pending for further action.

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35 U.S.C. § 112, second paragraph:

In the recent Office Action, claims 1-20, 37-44 and 48-57 were rejected under 35 U.S.C. § 112, second paragraph. These claims have been carefully reviewed in light of the Examiner's comments:

While Applicant does not necessarily agree that any of these claims were indefinite as filed, the indicated claims have been amended herein to address the issues raised by the Examiner under 35 U.S.C. § 112, second paragraph. Following this amendment, all the remaining claims are believed to be in compliance with 35 U.S.C. § 112 and notice to that effect is respectfully requested.

The amendments made in this regard are merely to clarify language to which the Examiner objected. These amendments do not, and are not intended to, narrow the scope of the claims.

Prior Art:

Claims 1, 2, 6-9, 18, 20, 37, 38 and 42-44 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Hamada et al (JP Patent No. 405251705A) ("Hamada"), Phillips et al. ("Transparent Conducting Thin Films of GaInO_3 ," Appl. Phys. Let. Vol. 65 (1), July 1994) ("Phillips") and Narushima et al. ("Electronic structure and transport properties in the transparent amorphous oxide semiconductor 2 CdOGeO", Phys Rev. B 66, 035203-1, 7/16/2002) ("Narushima"). For at least the following reasons, this rejection should be reconsidered and withdrawn.

Claim 1 recites:

A semiconductor device, comprising:
a drain electrode;
a source electrode;

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a channel contacting the drain electrode and the source electrode, wherein the channel includes one or more compounds of the formula $A_xB_xO_x$, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, each O is atomic oxygen, where each x is a non-zero number, but the value of "x" for each constituent element may be different, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form; and a gate dielectric positioned between a gate electrode and the channel.
(Emphasis added).

In contrast, the Office Action concedes that "Hamada et al., however, fails to disclose that compounds include gallium-tin oxide or that the compounds forming the channel region include one of an amorphous form and a mixed-phase crystalline form or that each x in the formula $A_xB_xO_x$ is independently a non-zero number." (Action, p. 3). Consequently, the Action cites to Phillips as teaching "the use of $GaIn_{1-x}Sn_xO_3$ (wherein each x in the formula is independently a non-zero number) as a replacement for a layer of ITO." (Action, p. 4) (citation omitted). This is incorrect on several points. The Action appears to have substantially misapprehended the Phillips reference.

In pertinent part, Phillips teaches " $GaIn_{1-x}Sn_xO_3$, for $0 \leq x \leq 0.20$." (Phillips p. 115). Thus, Phillips is teaching a material which includes both $GaInSnO_3$ molecules and $GaInO_3$ molecules, the average over the entire material being represented by $GaIn_{1-x}Sn_xO_3$, where $0 \leq x \leq 0.20$. Indium is a constituent of each molecule.

Consequently, Phillips does not teach or suggest gallium-tin oxide as recited in claim 1. Rather, Phillips only teaches gallium-indium-tin oxide or gallium-indium oxide. Therefore, the combination of Hamada and Phillips fails to teach or suggest the claimed channel "wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide."

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Additionally, Phillips does not, as alleged by the Office Action, teach or suggest "where each x is a non-zero number, but the value of " x " for each constituent element may be different," as recited in claim 1. While x may vary depending on the relative concentration of GaInSnO_3 molecules and GaInO_3 molecules in a sample of material, the x given in the formula $\text{GaIn}_{1-x}\text{Sn}_x\text{O}_3$ be the same for both instances of " x ." (Phillips, p. 115).

Finally, Phillips does not reasonably teach or suggest replacing the ITO layer of Hamada as suggested by the Office Action. (Action, p. 4). Applicant notes that the ITO channel taught by Hamada is, and must be, a *semi conducting* material or the transistor is non-functional. In contrast, the Phillips reference relates to "transparent *conducting* thin films." (Phillips, title). As noted in the first paragraph of Phillips, "Indium tin oxide (ITO) has become the [transparent *conducting* oxide] TCO of choice for a wide variety of applications." (Phillips, p. 115).

Consequently, Phillips may be viewed as suggesting the replacement of an ITO layer with GIO, GGIO, or GITO, *within the context of using such layers as highly-conductive "transparent conducting" materials*. Nowhere, however, does Phillips suggest using GIO, GGIO, or GITO layers in applications where a high-resistance semi conductive material is desired, such as, for example, in the thin-film transistor channel layer described by Hamada.

Thus, it is unreasonable to suggest that one of skill in the art would consider Phillips, which references ITO as a transparent *conducting* material, as suggesting to one of skill in the art that a *semi conducting* ITO layer should be replaced with some other transparent *conducting* material that is equivalent to ITO in an entirely separate use and context.

Narushima fails to address or remedy any of these deficiencies. (Action, p. 4)

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined,

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followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present case, the scope and content of the prior art, as evidenced by Hamada, Phillips and Narushima, did not include much of the claimed subject matter. Specifically, the claimed channel that "includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide" appears to be outside the scope and content of the prior art. The claimed channel with a material defined by the formula $A_xB_xO_x$, "where each x is a non-zero number, but the value of "x" for each constituent element may be different," is also outside the scope and content of the cited prior art. Moreover, the combination of Hamada and Phillips, as proposed in the Office Action, would not have been reasonable to one of ordinary skill in the art. Consequently, the cited prior art will not support a rejection of claim 1 under 35 U.S.C. § 103 and *Graham*.

Claim 18 similarly recites:

A semiconductor device, comprising:
a drain electrode;
a source electrode;
means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the means for controlling current flow includes one or more compounds of the formula $A_xB_xO_x$ wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but the value of "x" for each constituent element may be different,
wherein the channel includes one of an amorphous form and a mixed-phase crystalline form; and

a gate electrode separated from a channel by a gate dielectric.

(Emphasis added).

For the same reasons given above, the combination of Hamada, Phillips and Narushima fails to reasonably teach or suggest the claimed device with "means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the

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means for controlling current flow includes one or more compounds of the formula $A_xB_xO_x$, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but the value of " x " for each constituent element may be different." This subject matter has been shown to lie outside the scope and content of the cited prior art for the reasons given above. Therefore, the cited prior art will not support a rejection of claim 18 under 35 U.S.C. § 103 and *Graham*.

Claim 37 recites:

A semiconductor device formed by the steps, comprising:
providing a drain electrode;
providing a source electrode;
providing a precursor composition including one or more precursor compounds that include A_x and one or more compounds that include B_x , wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but the value of " x " for each constituent element may be different, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form;
depositing a channel including the precursor composition to form a multicomponent oxide from the precursor composition to electrically couple the drain electrode and the source electrode;
providing a gate electrode; and
providing a gate dielectric positioned between the gate electrode and the channel.

For the same reasons given above, the combination of Hamada, Phillips and Narushima fails to reasonably teach or suggest the claimed device "wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, where each x is a non-zero number, but the value of " x " for each constituent element may be different." This subject matter has been shown to lie outside the scope and content of the

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cited prior art for the reasons given above. Therefore, the cited prior art will not support a rejection of claim 37 under 35 U.S.C. § 103 and *Graham*.

Claims 10-13 and 39 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Hamada, Phillips, Narushima and Minami (of record). This rejection should be reconsidered and withdrawn for at least the same reasons given above in favor of the patentability of claims 1 and 37.

Claims 14-17 and 40-41 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Hamada, Phillips, Narushima, Minami (of record) and "D" ("Transparent Conducting PbO₂ films prepared by activated reactive evaporation," Phys. Rev. B 33, 2660-2664 (1986) ("D")). This rejection should be reconsidered and withdrawn for at least the same reasons given above in favor of the patentability of claims 1 and 37.

Claims 48-52 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of U.S. Patent No. 6,476,788 to Akimoto ("Akimoto"), Hamada, Phillips and Narushima. For at least the following reasons, this rejection should be reconsidered and withdrawn.

Independent claim 48 recites:

A display device, comprising:
a plurality of pixel devices configured to operate collectively to display images, where each of the pixel devices includes a semiconductor device configured to control light emitted by the pixel device, the semiconductor device including:
a drain electrode;
a source electrode;
a channel contacting the drain electrode and the source electrode,
wherein the channel includes one or more compounds of the formula $A_xB_xO_x$,
wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or

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more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, each O is atomic oxygen, where each x is a non-zero number, but the value of "x" for each constituent element may be different, wherein the channel includes one of an amorphous form and a mixed-phase crystalline form;

a gate electrode; and

a gate dielectric positioned between the gate electrode and the channel and configured to permit application of an electric field to the channel.

(Emphasis added).

For the same reasons given above, the combination of Hamada, Phillips and Narushima fails to reasonably teach or suggest the claimed device including a transistor channel "wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-lead oxide, each O is atomic oxygen, where each x is a non-zero number, but the value of "x" for each constituent element may be different." This subject matter has been shown to lie outside the scope and content of the cited prior art for the reasons given above.

Akimoto does not remedy the deficiencies of Hamada and Phillips explored above. Rather, Akimoto is merely cited for the context of transistors used in a display device with a plurality of pixel devices. Therefore, the cited prior art will not support a rejection of claim 48 under 35 U.S.C. § 103 and *Graham*.

Claims 53 and 54 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Akimoto, Hamada, Phillips, Narushima and Minami (of record). This rejection should be reconsidered and withdrawn for at least the same reasons given above in favor of the patentability of claim 48.

Claims 55 and 56 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Akimoto, Hamada, Phillips, Narushima, Minami and D. This

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rejection should be reconsidered and withdrawn for at least the same reasons given above in favor of the patentability of claim 48.

Conclusion:

In view of the foregoing arguments, all claims are believed to be in condition for allowance over the prior art of record. Therefore, this response is believed to be a complete response to the Office Action. However, Applicant reserves the right to set forth further arguments in future papers supporting the patentability of any of the claims, including the separate patentability of the dependent claims not explicitly addressed herein. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed.

The absence of a reply to a specific rejection, issue or comment in the Office Action does not signify agreement with or concession of that rejection, issue or comment. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment. Further, for any instances in which the Examiner took Official Notice in the Office Action, Applicants expressly do not acquiesce to the taking of Official Notice, and respectfully request that the Examiner provide an affidavit to support the Official Notice taken in the next Office Action, as required by 37 CFR 1.104(d)(2) and MPEP § 2144.03.

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If the Examiner has any comments or suggestions which could place this application in better form, the Examiner is requested to telephone the undersigned attorney at the number listed below.

Respectfully submitted,



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